

REMARKS

In the Office Action mailed January 29, 2003:

Claims 1-7 and 20-26 were rejected under 35 U.S.C. 102(e) as being anticipated by Tanaka et al., U.S. Patent 6,265,762.

Claims 8 and 27 were rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al., U.S. Patent 6,265,762, as applied to claims 1 and 20 above.

Claims 9-13 were rejected under 35 U.S.C. 103(a) as being unpatentable over Lacap, U.S. Patent 5,905,299, in view of Tanaka et al., U.S. Patent 6,265,762.

As semiconductor die sizes have become smaller, bond pad pitches have become smaller, bond wire lengths have become longer and wire-to-wire separations have become smaller. At the same time bond wire diameters have also become smaller. As a result, the wires are relatively flexible and prone to contact each other to form short circuits when liquified molding materials flow over the top of the die.

To prevent this from happening, the present invention provides an intermediate lead finger to which an intermediate portion of a bond wire is coupled (independent Claim 1), or attached (as in independent Claim 9) or affixed (as in independent Claim 20). (*See* Specification at 4, ll. 17-18.) As a result, the movement of the bond wires is more limited because the bond wires are now effectively divided into two shorter portions. (*See* Specification at 4, ll. 19-20.) The shorter bond wire segments have greater structural integrity, thereby reducing the chance of creating a short with an adjacent bond wire and otherwise operating to withstand mechanical stress. (*See* Specification at 4, ll. 23-26.)

To further emphasize the distinction between applicant's invention and the prior art, claims 1, 9, and 20 have been amended to indicate that the coupling, attachment, and affixing of the intermediate lead finger to the intermediate portion of the bond wire is secure enough to survive a subsequent molding process. Claims 3 and 22 have been amended for clarity.

Claim Rejections - 35 U.S.C. § 102(e)

Claims 1-7 and 20-26

The Examiner states that the Applicant's arguments filed December 11, 2002, are not persuasive because Tanaka teaches "direct contact between the support body and the bond wires." (Office Action dated January 29, 2003, page 2, paragraph 6.) Applicant's claims, however, require more than mere contact between the bond wires and the intermediate lead fingers. They require the bond wire to be coupled, attached or affixed. After reviewing the

Examiner's explanations and further examination of the Tanaka specifications, the Applicant respectfully disagrees with the Examiner's equating of Tanaka's direct contact with the instant application's coupling, attachment and affixing.

Although Tanaka does teach the direct contact of a supporting body and the bond wires, this direct contact is different from the instant application's coupling/attachment/affixing because this direct contact is due to the bond wires coming to rest upon the supporting body, and not the securing of the bond wire to the supporting body. Tanaka seeks to reduce short-circuits by increasing the stability of the wire that is bonded between the pad electrodes and the inner leads, by keeping the wire at a particular height while bonding occurs. Figure 8 shows an embodiment where a wire supporting portion (15) supports and maintains a loop of wire at a particular height. Figure 10 shows a similar embodiment where the wire supporting portion (15) is retracted "after wire bonding is completed," but prior to the molding process. (Tanaka, col. 10, line 61.) Consideration of these two embodiments jointly reveals the meaning of *Tanaka's direct contact: the wire supporting portion (15) may remain in place during the molding process, but it has no function beyond elevating the bond wire to a particular height during wire bonding.* Furthermore, there is no suggestion in Tanaka that the bond wire be permanently secured to the wire supporting portion.

In contrast, the instant application requires not only that the intermediate lead finger remain in place during the molding process, but also that the coupling or attachment of the bond wire to the intermediate lead finger be secure enough to withstand the forces with which the molding material is injected. In particular, in the specifications at page 4, lines 15-26, Applicant describes the coupling and attachment of an intermediate portion of the bond wire to the intermediate lead finger, stating that this coupling and attachment must withstand the forces created "when molding material is poured over the package." (Spec., pg. 4, lines 21-22.) The instant application's coupling and attachment, thus, differ from Tanaka's direct contact in both strength and purpose. While Tanaka's direct contact need only elevate the bond wire at a particular height for wire bonding, more is required of *the instant application's coupling and attachment: the intermediate lead finger must remain secured to the intermediate portion of the bond wire even after the wire bonding is complete, and must remain secured while the forces of the molding material act on the bond wire during a subsequent molding process.*

Tanaka, thus, does not teach or suggest a semiconductor package with an intermediate lead finger securely coupled, or affixed to the bond wire as required by Claims 1 and 20. These claims, then, should not be rejected under 35 U.S.C. § 102(e) as being anticipated by Tanaka. Further, claims 2-7 and 21-26, which are dependent from Claims 1 and 20, respectively, are allowable for at least the same reasons that Claims 1 and 20 are allowable.

Claim Rejections - 35 U.S.C. § 103(a)

To establish a prima facie case of obviousness, three basic criteria must be met:

- 1) there must be some suggestion or motivation in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings;
- 2) there must be a reasonable expectation of success; and
- 3) the prior art reference must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. (In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)).

Claims 8 and 27

The Examiner has rejected dependent Claims 8 and 27 under 35 U.S.C. §103(a) as being unpatentable over Tanaka. Claim 8 is dependent on independent Claim 1, and Claim 27 is dependent on independent Claim 20. As shown above, Tanaka does not disclose, teach, or suggest all the limitations of independent Claims 1 and 20. Therefore dependent Claims 8 and 27 likewise are allowable under §103(a) over Tanaka.

Claims 9-13

The Examiner has rejected Claims 9-13 under 35 U.S.C. §103(a) as being unpatentable over Tanaka in view of Lacap. At page 5, paragraph 2, of the Office Action dated January 29, 2003, the Examiner acknowledged that "Lacap fails to teach the attachment of an intermediate lead finger to an intermediate lead finger mounting substrate, wherein the intermediate lead finger is positioned between the package lead and the bond pad and attached to an intermediate portion of the bond wire." However, as pointed out above, Tanaka likewise fails to teach the attachment of an intermediate lead finger to an intermediate

portion of the bond wire. Since neither Tanaka nor Lacap, either taken alone or in combination, discloses, teaches, or suggests all the limitations of independent Claim 9, Claim 9 is likewise allowable under 35 U.S.C. §103(a) over Tanaka in view of Lacap. Further, Claims 10-13, which are dependent on independent Claim 9, are also allowable for at least the same reasons claim 9 is allowable.

Conclusion

In view of the foregoing, applicants believe that all of the claims are now in condition for allowance and respectfully requests the Examiner to pass the subject application to issue. If for any reason the Examiner believes any of the claims are not in condition for allowance, he is encouraged to phone the undersigned at (650) 849-7777 so that any remaining issues may be resolved.

Respectfully submitted,

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APPENDIX A

Changes to the Claims

The rewritten claims were revised as follows:

1. (Amended) A semiconductor package, comprising:
 - a semiconductor die with a bond pad;
 - a package lead;
 - a bond wire comprising a first end portion coupled to the package lead, a second end portion coupled to the bond pad, and an intermediate portion; and
 - an intermediate lead finger positioned between the package lead and the bond pad, wherein the intermediate lead finger is coupled to the intermediate portion of the bond wire, and remains so coupled through a subsequent molding process.
3. (Amended) The package of claim [1] 2, wherein the intermediate lead finger and the intermediate lead finger mounting substrate are formed of a non-conducting material.
9. (Amended) A semiconductor package, comprising:
 - an intermediate lead finger mounting substrate having a first surface and a second surface;
 - a semiconductor die with a bond pad, the semiconductor die being attached on the first surface of the intermediate lead finger mounting substrate;
 - a package lead;
 - a bond wire comprising a first end portion coupled to the package lead, a second end portion coupled to the bond pad, and an intermediate portion;
 - an intermediate lead finger mounted on the first surface of the intermediate lead finger mounting substrate, wherein the intermediate lead finger is positioned between the package lead and the bond pad, and wherein the intermediate lead finger is attached to the intermediate portion of the bond wire, and remains so attached through a subsequent molding process;
 - a heat sink coupled to the second surface of the intermediate lead finger mounting substrate; and

a mold compound that encloses the semiconductor die, a portion of the package lead, the bond wire, the intermediate lead finger, and the heat sink.

20. (Amended) A semiconductor package, comprising:
- a semiconductor die with a bond pad;
 - a package lead;
 - a bond wire comprising a first end portion coupled to the package lead, a second end portion coupled to the bond pad, and an intermediate portion; and
 - an intermediate lead finger positioned between the package lead and the bond pad, the intermediate lead finger affixing at least part of the intermediate portion of the bond wire at a position between the semiconductor die and the package lead, and remains so affixed through a subsequent molding process.

22. (Amended) The package of claim [20] 21, wherein the intermediate lead finger and the intermediate lead finger mounting substrate are formed of a non conducting material.